Please type a plus sign (+) inside this box [+]

10-23-00

A

PTO/SB/05 (2/98)

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for nonprovisional applications under 37 CFR § 1.53(b))

Attorney Docket No.	853063.482
First Inventor or Application Identifier	Roberto Peritore
Title	CALIBRATION TECHNIQUE OF A BEMF DETECTOR
Express Mail Label No.	EL615486863US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Box Patent Application**
Assistant Commissioner for Patents
Washington, D.C. 20231

1. [X] General Authorization Form & Fee Transmittal *(Submit an original and a duplicate for fee processing)*
2. [X] Specification [Total Pages] 12 *(preferred arrangement set forth below)*
   - Descriptive Title of the Invention
   - Cross References to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to Microfiche Appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
3. [X] Drawing(s) *(35 USC 113)* [Total Sheets] 4
4. Oath or Declaration [Total Pages] 4
   a. [X] Newly executed (original or copy)
   b. [ ] Copy from a prior application (37 CFR 1.63(d)) *(for continuation/divisional with Box 17 completed)*
      i. [ ] DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b)
5. [ ] Incorporation By Reference *(useable if box 4b is checked)* The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered to be part of the disclosure of the accompanying application and is hereby incorporated by reference therein.
6. [ ] Microfiche Computer Program *(Appendix)*
7. Nucleotide and Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. [ ] Computer-Readable Copy
   b. [ ] Paper Copy (identical to computer copy)
   c. [ ] Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. [X] Assignment Papers (cover sheet & document(s))
9. [ ] 37 CFR 3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
10. [ ] English Translation Document *(if applicable)*
11. [ ] Information Disclosure Statement (IDS)/PTO-1449 [ ] Copies of IDS Citations
12. [ ] Preliminary Amendment
13. [X] Return Receipt Postcard
14. [ ] Small Entity Statement(s) [ ] Statement filed in prior application, Status still proper and desired
15. [ ] Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. [X] Other: Certificate of Express Mail
    Check

17. **If a CONTINUING APPLICATION,** *check appropriate box and supply the requisite information below and in a preliminary amendment*

[ ] Continuation [ ] Divisional [ ] Continuation-In-Part (CIP) of prior Application No.: _____

Prior application information: Examiner _____ *Group / Art Unit* _____

[X] Claims the benefit of Provisional Application No. **60/215,808, filed July 5, 2000**

CORRESPONDENCE ADDRESS

00500

00500

PATENT TRADEMARK OFFICE

Robert Iannucci
Seed Intellectual Property Law Group PLLC
701 Fifth Avenue, Suite 6300
Seattle, Washington 98104-7092
Phone: (206) 622-4900
Fax: (206) 682-6031

Respectfully submitted,

TYPED or PRINTED NAME Robert Iannucci REGISTRATION NO. 33,514

SIGNATURE _____ Date 10/20/00

U:\bobi\sgs\853063\482\02-ptosb05.doc

10/20/00 JC05 U.S. PTO

09/693199 JC05 U.S. PTO 10/20/00

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Roberto Peritore, Alberto Salina, Andrea Merello, Lorenzo Papillo, Francesco Vavala, and Gianluca Ventura
Filed	:	October 20, 2000
For	:	CALIBRATION TECHNIQUE OF A BEMF DETECTOR

Docket No. : 853063.482

Date : October 20, 2000

Box Patent Application
Assistant Commissioner for Patents
Washington, DC 20231

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

Assistant Commissioner for Patents:

I hereby certify that the enclosures listed below are being deposited with the United States Postal Service "EXPRESS MAIL Post Office to Addressee" service under 37 C.F.R. § 1.10, Mailing Label Certificate No. EL615486863US, on October 20, 2000, addressed to Box Patent Application, Assistant Commissioner for Patents, Washington, DC 20231.

Respectfully submitted,

Seed Intellectual Property Law Group PLLC

Sam Haile

RXI:asl

Enclosures:

Postcard
Check
Form PTO/SB/05
General Authorization Under 37 C.F.R. § 1.136(a)(3) and Fee Transmittal (+ copy)
Specification, Claims, Abstract (12 pages)
4 Sheets of Drawings (Figures 1-4)
Declaration and Power of Attorney
Form PTO-1595
Assignment

EXPRESS MAIL NO. EL615486863US

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Roberto Peritore, Alberto Salina, Andrea Merello, Lorenzo Papillo, Francesco Vavala, and Gianluca Ventura
Title	:	CALIBRATION TECHNIQUE OF A BEMF DETECTOR
Docket No.	:	853063.482
Date	:	October 20, 2000

Box Patent Application
Assistant Commissioner for Patents
Washington, DC 20231

GENERAL AUTHORIZATION UNDER 37 C.F.R. § 1.136(a)(3)
AND FEE TRANSMITTAL

Assistant Commissioner for Patents:

With respect to the above-identified application, the Assistant Commissioner is authorized to treat any concurrent or future reply requiring a petition for an extension of time under 37 C.F.R. § 1.136(a)(3) for its timely submission as incorporating a petition therefor for the appropriate length of time. The Assistant Commissioner is also authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account No. 19-1090.

With respect to the above-identified application, the fee is calculated below:

For	Number filed	Number extra		Rate		
Basic Fee						**$ 710**
Total Claims	5	0	X	$ 18	=	**$ 0**
Independent Claims	2	0	X	$ 80	=	**$ 0**
Multiple Dependent Claim					+	**$ 0**
Assignment Fee					+	**$ 40**
TOTAL FILING FEE						**$ 750**
Extension-of-time fee (parent)					+	**$ 0**
TOTAL						**$ 750**

A check in the amount of $750 is enclosed to cover the filing fee.

The Assistant Commissioner is authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 which may be required, or credit any overpayment, to Deposit Account No. 19-1090. A duplicate copy of this request is enclosed.

Date 10/20/00

Robert Iannucci
Registration No. 33,514

RXI:asl

Seed Intellectual Property Law Group PLLC
701 Fifth Avenue, Suite 6300
Seattle, Washington 98104-7092
Phone: (206) 622-4900
Fax: (206) 682-6031

U:\bobi\sgs\853063\482\01-gen auth.doc

Calibration technique of a BEMF detector

* * * * *

DESCRIPTION

The present invention relates to the positioning of the read/write transducer heads of an hard disk (HD) in a designated landing zone when requested or when the electrical power is removed from the drive. In particularly it relates to the detection of the back electromotive force (BEMF) of the motor involved in the positioning of the read/write transducer heads.

A recent parking system (Ramp Loading technology) automatically performs a park when HD driver power supply fails or when the HD controller asks for it, by means of a Voice Coil Motor (VCM).

To obtain a ramp loading system is mandatory to have a signal at least proportional to the speed of the motor, in order to have a good control of the positioning of the read/write transducer heads.

Infact the BEMF measurement is compared to a velocity command signal in order to sense deviation of the motor actual speed from the desired speed, and in response adjusts the drive applied to the motor to correct for the speed deviation.

Since no servo tracks are available on the ramp, VCM speed is not known. This is the reason why information about speed have to be obtained by the motor itself.

In fact back electromotive force is proportional to VCM speed through:

$$[1]\quad E = Ke \cdot \omega = \frac{Ke}{armlenght} \cdot speed$$

where Ke is the proportionality coefficient between angular speed and the back electromotive force.

Nowadays, two possible systems are known in order to obtain the speed detection.

A first way of sensing the BEMF is using the voltage across the power bridge, that is the driver of the VCM, and the current flowing in the motor to compute the BEMF generated by the motor (continuous mode).

The second approach considers that if the Voice Coil power bridge is put in a tristate condition and the time for a complete current decay in the motor is elapsed, no current is present in the VCM then the only voltage read across the coil is the back electromotive force (discontinuous mode).

Ramp Loading systems working in continuous mode suppose that the BEMF of the VCM is read continuously in time and it is not sampled.

In reality, the BEMF measured across a motor coil is not perfectly proportional to the motor rotational speed. Factor responsible for the imperfection are the motor resistance Rm, the sense resistor Rs and the elements (resistance and amplifiers) used in the measurement circuit.

The measured BEMF, then, can be viewed as the sum of these error component and an ideal BEMF to which the motor rotational speed is proportional.

In some applications, however, it is desirable to more accurately control motor speed. In such applications the BEMF measurement error is unacceptable. One example is the case mentioned of a voice-coil motor for a head actuator. It is important to accurately control the speed of a read/write head as it is being loaded onto a disk, so that the head does not strike the disk hard and cause damage. Similarly, it is important to avoid striking the head against a head stop when retracting the head from the disk.

Are known circuits able to accurately measuring the BEMF of a VCM but require a double calibration circuit to reduce said measurement error.

In view of the state of the art described, it is an object of the present invention to provide a circuit able to accurately measuring the BEMF of a VCM with a single calibration circuit.

According to the present invention, these and other objects are attained by means of a BEMF detection circuit for a voice-coil motor operative to

continually generate a signal proportionally to the velocity of said voice-coil motor comprising a algebraic summing node producing at its output the BEMF of the voice-coil motor and receiving: a first voltage proportional to the voltage across the voice-coil motor; a second voltage representing the product of a first multiplier factor and a voltage proportional to the current in the coil; a third voltage representing the product of a prefixed bias voltage Vref and a second multiplier factor; said third voltage is calibrated by a single calibration circuitry operative to calibrate said second multiplier factor in response to a calibration control signal, in order to cancel said second voltage.

Such objects are also attained by a BEMF detection circuit for a voice-coil motor operative to continually generate a signal proportionally to the velocity of said voice-coil motor such that said signal is the sum of a first signal component, a second signal component and a third signal component; the first signal component representing the product of a first multiplier factor and the voltage across the coil, the second signal component representing the product of a second multiplier factor and the current in the coil; the third signal component representing a signal able to eliminate said second signal component.

Tanks to the present invention it is possible to provide a circuit able to accurately measuring the BEMF of a VCM which is more precise, require less circuits and therefore less space.

The features and the advantages of the present invention will be evident from the following detailed description, illustrated as a non-limiting example in the annexed drawings, wherein:

Figure 1 shows a power bridge driver of the VCM;

Figure 2 shows a BEMF detection circuit according to the prior art;

Figure 3 shows an embodiment of a BEMF detection circuit according to the present invention;

Figure 4 shows a further embodiment of a BEMF detection circuit

according to the present invention.

Referring now to figure 1, where is shown a power bridge driver of the VCM, an hard disk controller 10, by means of a digital to analog converter not shown, supply a signal to the power bridge driver for its working. The signal is supplied to the resistance R1 which in turn is connected to a node 11. At the node 11 is connected the inverting input of an error amplifier EA, the non inverting input is connected to a voltage reference or ground and the output is connected to a node 12. Between the node 11 and 12 are connected in series a capacitor Cc and a resistance Rc, they with the error amplifier EA act as an integrator circuit. At the node 12 is also connected the input of the negative power driver 13, the output of which is connected to the node Vcm, and the input of the positive power driver 14, the output of which is connected to the node Vcp. A resistance Rs is connected between the node Vcm and a node Vsense. A VCM motor is connected between the node Vcp and the node Vsense. The VCM motor is represented in figure 1 by means of a resistance Rm, a inductor Lm and a voltage generator E, which correspond to the BEMF voltage. At the node Vcm is also connected the inverting input of a sensing amplifier SA, the non inverting input of which is connected to the node Vsense, the output of the sensing amplifier SA is connected to a resistance R2 in turn connected to the node 11.

The signal coming from the driver controller 10 is supplied to the error amplifier EA and it drive the power drivers 13 and 14, the sensing amplifier and the resistance R2 perform a negative feedback of the power bridge driver.

The voltage across the power bridge is given by:

$$[2]\quad Vcm - Vcp = (Rs + Rm)\cdot \mathrm{Im} + Lm\cdot\frac{d}{dt}\cdot \mathrm{Im} + E$$

Where E = Ke*ω is the VCM BEMF, Rm and Lm are the electrical parameters of the VCM, and Im is current flowing in the VCM.

In steady conditions eq. [2] becomes:

[3] $Vcm - Vcp = (Rs + Rm) \cdot \mathrm{Im} + E$

In order to obtain a voltage proportional to the BEMF, herewith called VTACH, we can use Vsense, Vcm and Vcp to obtain:

[4] $VTACH = (Vcp - Vcm) + (Vcm - V\mathrm{sense}) \cdot \alpha((Rs + Rm) \cdot \mathrm{Im} + E) - Rs \cdot \mathrm{Im} \cdot \alpha$

where α is a calibration parameter.

To obtain VTACH voltage, some other solutions, which are not dealt herewith, are known. The main differences are based on how Vcm, Vcp and Vsense are combined each other. This solution has shown to be the most efficient in terms of VTACH/Offset.

Rearranging it gives:

[5] $VTACH = E + \mathrm{Im} \cdot ((Rs + Rm) - \alpha \cdot Rs)$

and if:

[6] $\alpha = \dfrac{Rs + Rm}{Rs}$

equation [4] gives VTACH = E (or BEMF) for every VCM current.

Referring now to figure 2 where is shown a BEMF detection circuit according to the prior art, there is a VCM motor, a resistance Rs and the nodes Vcp, Vsense and Vcm as in figure 1 but it is not shown the power bridge driver. The node Vcp is connected to a first resistance R which in turn is connected to a non inverting input of an operational amplifier 20 with the function of summing node. The node Vsense is connected to a second resistance R and to a first resistance Ra, in parallel with the second resistance R, which in turn are connected to an inverting input of the

operational amplifier 20. Between the inverting input of the operational amplifier 20 and its output is connected to a first resistance Rb. The node Vcm is connected to a second resistance Ra which in turn is connected to the non inverting input of the operational amplifier 20. To the non inverting input of the operational amplifier 20 is also connected to a second resistance Rb which in turn is connected to a prefixed bias voltage Vref. The output of the operational amplifier 20 produces the voltage VTACH which is supplied to the hard disk controller 10 by means of an analog to digital converter not shown.

The two resistances Ra must be calibrated in order to get the correct BEMF. It require two circuit to performs such a calibration.

In this case the BEMF is obtained as follows:

$$[7]\ VTACH = \frac{Rb}{R} \cdot BEMF + \mathrm{Im} \cdot Rb \cdot \left(\frac{Rm}{R} - \frac{Rs}{Ra} \right) + REF$$

by calibrating the second term of sum:

$$[8]\ Ra = \frac{Rs}{Rm} \cdot R$$

we obtain:

$$[9]\ VTACH = \frac{Rb}{R} \cdot BEMF + REF$$

This solution provides a correct BEMF information, but it needs to use 2 trimming (the two Ra in figure 2) to compensate the Rm and Rs variation.

We refer now to figure 3 where is shown an embodiment of a BEMF detection circuit according to the present invention. As in figure 2, there is a VCM motor, a resistance Rs and the nodes Vcp, Vsense and Vcm as in figure 1 but it is not shown the power bridge driver. The node Vcp is connected to a first resistance R which in turn is connected to a non

inverting input of an operational amplifier 30 with the function of summing node. At the non inverting input of the operational amplifier 30 are also connected a first resistance Ra and first resistance Rb, which in turn are both connected to a prefixed bias voltage Vref. The node Vcm is connected to a second resistance R which in turn is connected to the inverting input of the operational amplifier 30. The node Vsense is connected to a non inverting input of an operational amplifier 31 having gain G, the node Vcm is connected to an inverting input of the operational amplifier 31. The output of the operational amplifier 31 is connected to a terminal of a calibration element Rt that in this case correspond to the calibration element Rtot. The other terminal of Rt is connected to a prefixed bias voltage Vref.

The calibration element Rt comprise an resistive element having a first and a second terminal including a plurality of resistances connected in series. Each terminal of the plurality of resistances is connected to a terminal of a plurality of controlled switches SW, the other terminal of each of said switches are connected together to form a node 32. In response of a digital calibration control signal coming from the hard disk controller 10 one switches SW are closed in order to take, on said node 32, a portion of the voltage applied on the calibration element Rt. The portion of the calibration element Rt from the point where a switch SW is closed to the terminal connected to Vref is called Rx. The node 32 is connected to a non inverting input of an operational amplifier 33, the inverting input is connected to its output. The output of the operational amplifier 33 is connected to a second resistance Ra which in turn is connected to the inverting input of the operational amplifier 30. Between the inverting input of the operational amplifier 20 and its output is connected to a second resistance Rb.

We refer now to figure 4 where is shown a further embodiment of a BEMF detection circuit according to the present invention. As in figure 2, there is a VCM motor, a resistance Rs and the nodes Vcp, Vsense and Vcm as in figure 1 but it is not shown the power bridge driver. The circuit in

figure 4 is similar to the one of figure 3 except the part of circuit around the calibration element Rt. All the elements that correspond to that of figure 3 have the reference. The node Vsense is connected to a non inverting input of an operational amplifier 31 having gain G, the node Vcm is connected to an inverting input of the operational amplifier 31. The output of the operational amplifier 31 is connected to a non inverting input of another operational amplifier 41 which has the function of follower, in fact the inverting input of the operational amplifier 41 is connected to its output. The output of the operational amplifier 41 is connected to a terminal of the calibration element Rt. Another operational amplifier 42 has the non inverting input connected to a prefixed bias voltage Vref, the output of which is connected to the other terminal of the calibration element Rt. The inverting input of the operational amplifier 42 is connected to an intermediate point of the calibration element Rt. In this case the portion of the calibration element Rt comprised between its contact point with the inverting input of the operational amplifier 42 and the terminal of Rt connected to the output of the operational amplifier 41, correspond to the calibration element Rtot. In this case the resistance Rx is comprised between the connection point of the non inverting input of the operational amplifier 33 and the connection point of the non inverting input of the operational amplifier 42, to the resistance Rt. All the other part of the circuit are equal to that of figure 3.

According to the circuits of figure 3 and 4 the VTACH that is equivalent at BEMF is:

[10]

$$VTACH = \frac{Rb}{R} \cdot (VCP - VCM) + G \cdot Rs \cdot \mathrm{Im} \cdot \left(\frac{Rx}{Rtot} + REF - REF \right) \cdot \frac{Rb}{Ra} + REF$$

rearranging it gives:

$$[11]\ VTACH = \left[(Rm + Rs) \cdot \frac{Rb}{R} - G \cdot Rs \cdot \left(\frac{Rx}{Rtot} \cdot \frac{Rb}{Ra} \right) \right] \cdot \mathrm{Im} + BEMF \cdot \frac{Rb}{R} REF$$

with calibration:

$$[12]\ \frac{Rx}{Rtot} = \left(\frac{Rm + Rs}{G \cdot Rs} \cdot \frac{Ra}{R} \right)$$

after the calibration, the VTACH (figure 4) have the following expression:

$$[13]\ VTACH = BEMF \cdot \frac{Rb}{R} + REF$$

According to the present invention it is sufficient only a calibration (or trimming) circuit instead of two as in the prior art: it simplify the working, the circuit and it is less expensive.

The trimming of the calibration element Rt is done by means of a word coming from a hard disk controller 10 and it can be changed, if necessary, during the working.

In the example herewith described the calibration element Rt comprises a plurality of resistances connected to a plurality of switches but it can be carry out by means of other calibration elements.

CLAIMS

1. A BEMF detection circuit for a voice-coil motor operative to continually generate a signal proportionally to the velocity of said voice-coil motor comprising a algebraic summing node producing at its output the BEMF of the voice-coil motor and receiving:

a first voltage proportional to the voltage across the voice-coil motor;

a second voltage representing the product of a first multiplier factor and a voltage proportional to the current in the coil;

a third voltage representing the product of a prefixed bias voltage Vref and a second multiplier factor;

said third voltage is calibrated by a single calibration circuitry operative to calibrate said second multiplier factor in response to a calibration control signal, in order to cancel said second voltage.

2. BEMF detection circuit according to claim 1, wherein said single calibration circuitry comprises: an resistive element having a first and a second terminal including a plurality of resistances connected in series, the first terminal is coupled to a prefixed bias voltage and the second terminal is receiving a signal proportional to the current in the coil;

said plurality of resistances are connected to a plurality of controlled switches controlled by said calibration control signal, a terminal of each of said switches are connected together to form a node, on said node is possible to take a portion of the voltage applied on said plurality of resistances in response to said calibration control signal.

3. BEMF detection circuit according to claim 2, wherein said signal proportional to the current in the coil is produced by an operational amplifier which amplify a voltage on a resistance on which the current in the coil is flowing.

4. A BEMF detection circuit for a voice-coil motor operative to continually generate a signal proportionally to the velocity of said voice-coil motor such that said signal is the sum of a first signal component, a second

signal component and a third signal component,

the first signal component representing the product of a first multiplier factor and the voltage across the coil;

the second signal component representing the product of a second multiplier factor and the current in the coil;

the third signal component representing a signal able to eliminate said second signal component.

5. BEMF detection circuit according to claim 4, wherein said third signal component is determined in order to have amplitude equal to said second signal component and opposite sign.

Calibration technique of a BEMF detector

* * * * *

ABSTRACT

The present invention relates to the positioning of the read/write transducer heads of an hard disk (HD) in a designated landing zone when requested or when the electrical power is removed from the drive. In particularly it relates to the detection of the back electromotive force (BEMF) of the motor involved in the positioning of the read/write transducer heads. According to an embodiment of the present invention a BEMF detection circuit for a voice-coil motor operative to continually generate a signal proportionally to the velocity of said voice-coil motor comprises a algebraic summing node producing at its output the BEMF of the voice-coil motor and receiving: a first voltage proportional to the voltage across the voice-coil motor; a second voltage representing the product of a first multiplier factor and a voltage proportional to the current in the coil; a third voltage representing the product of a prefixed bias voltage Vref and a second multiplier factor; said third voltage is calibrated by a single calibration circuitry operative to calibrate said second multiplier factor in response to a calibration control signal, in order to cancel said second voltage.

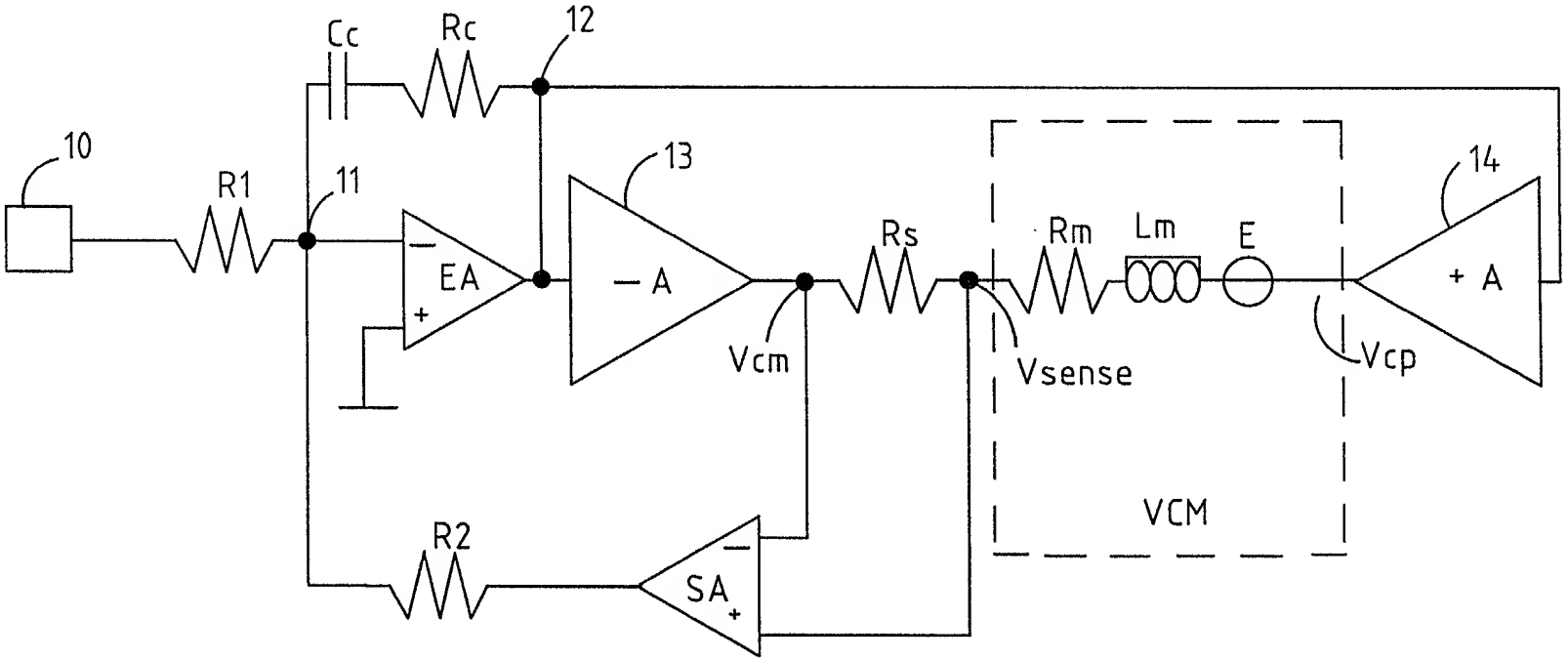

Fig.1

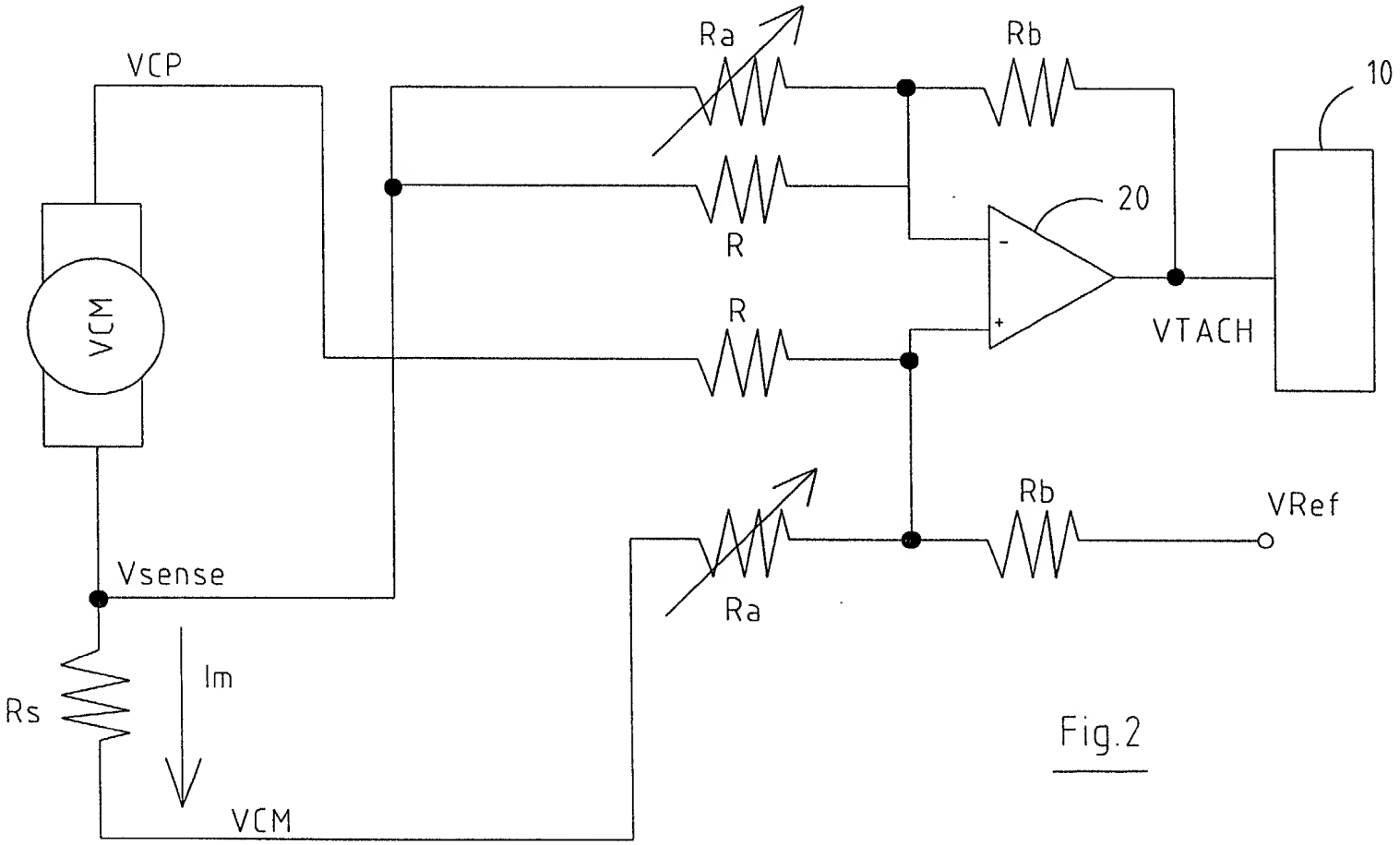

Fig.2

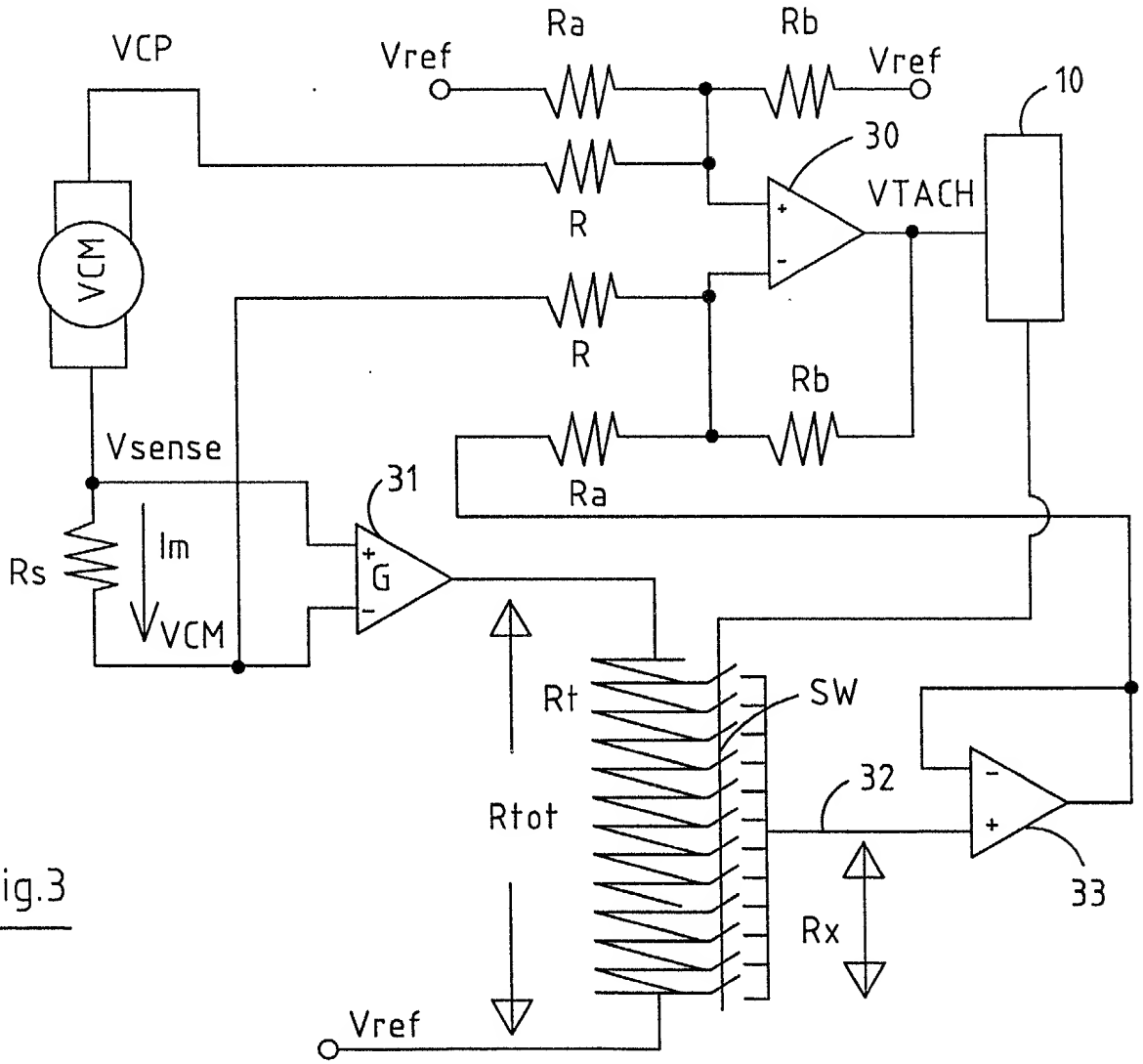
VCP
Vref
Ra
Rb
Vref
10
30
VTACH
R
VCM
R
Rb
Vsense
Ra
31
Rs
Im
G
VCM
Rt
SW
32
Rtot
33
Rx
Vref

Fig.3

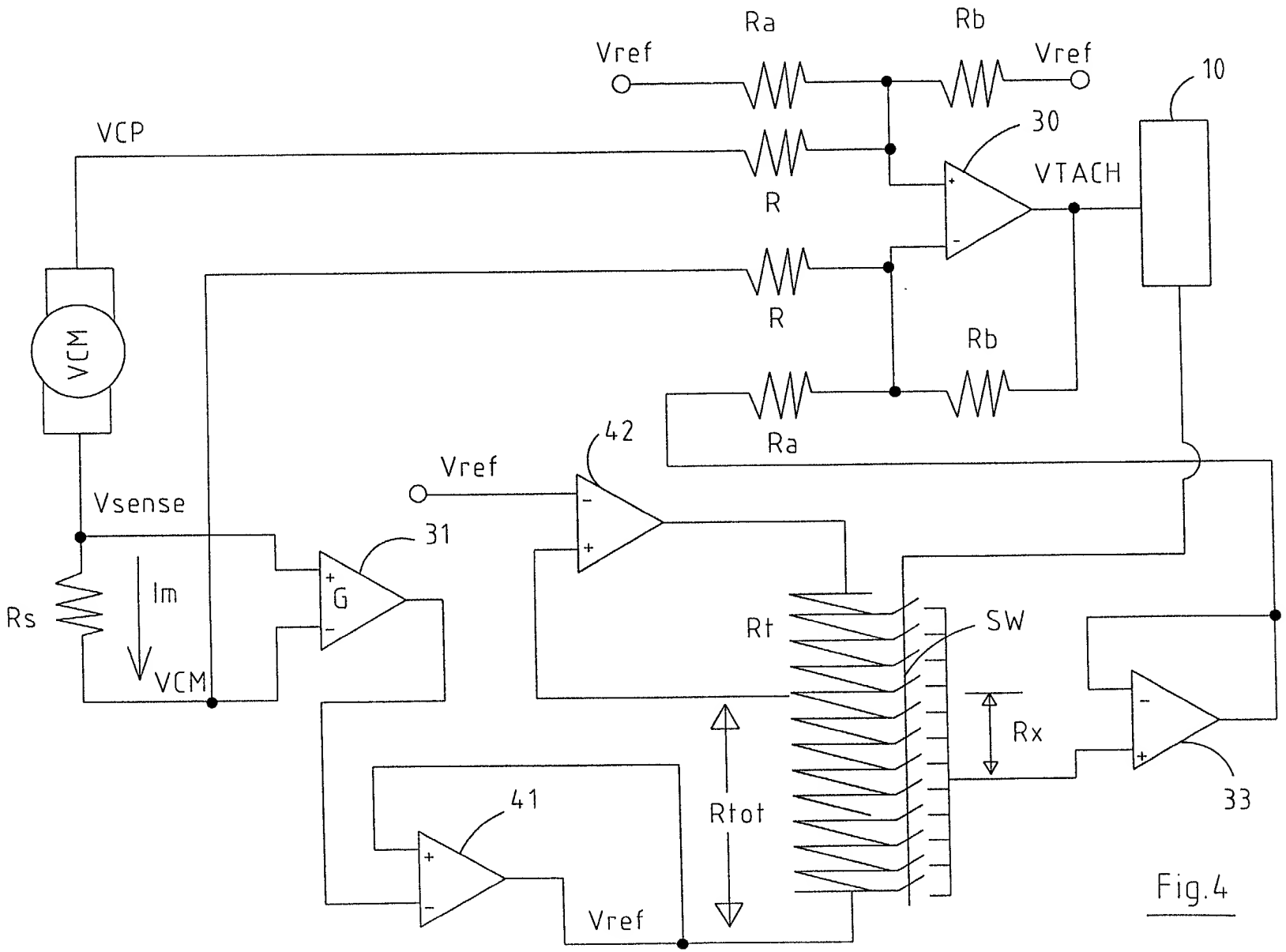
Ra
Rb
Vref
Vref
10
VCP
30
VTACH
R
R
Rb
Ra
VCM
42
Vref
Vsense
31
Rs
Im
G
VCM
Rt
SW
Rx
33
41
Rtot
Vref

Fig.4

Declaration and Power of Attorney For Patent Application
Modulo di Dichiarazione Per Domanda di Brevetto

Italian Language Declaration

Io, sottoscritto inventore, dichiaro con il presente che:

Il mio domicilio, recapito postale e cittadinanza sono quelli indicati in calce accanto al mio nome,

Che mi reputo in buona fede essere l'inventore originario, primo e unico (qualora un solo nominativo appaia elencato appresso) o il coinventore (qualora i nominativi siano più di uno) primo e originario dell'invenzione da me rivendicata, e per la quale faccio domanda di brevetto. Tale invenzione é chiamata

_____

_____

_____

e la sua descrizione è:

(contrassegnare uno dei due)

☐ qui acclusa.

☐ è stata presentata il _____

come Domanda Numero _____

ed è stata rettificata il _____.
(se applicabile)

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Calibration technique of a BEMF detector

_____

_____

the specification of which

(check one)

☑ is attached hereto.

☐ was filed on _____

as Application No. _____

Dichiaro inoltre con il presente di aver letto e compreso il contenuto della specificazione sopra indicata, comprese le rivendicazioni, come rettificata da qualsiasi emendamento a cui si sia accennato sopra.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

Riconosco il mio dovere di rivelare informazioni che costituiscano materiale per l'esame della presente domanda secondo i termini del Titolo 37, Codice dei Regolamenti Federali, Comma 1,56(a).

I acknowledge the duty to disclose information which is material to the patentability and examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Italian Language Declaration

Con il presente rivendico i benefici di priorità per l'estero come stabilito dal Titolo 35, Codice degli Stati Uniti, Comma 119, per qualsiasi domanda di brevetto (o brevetti) straniera o per qualsiasi certificato d' invenzione sotto elencato, ed ho anche elencato qui sotto tutte le domande di brevetto e certificati d'invenzione stranieri aventi una data di presentazione anteriore a quella della domanda per la quale si rivendica la precedenza:

I hereby claim foreign priority benefits under Title 35, United States Code, §119, of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior foreign applications Domande dall'estero precedenti			Priority claimed Priorità Rivendicata	
60/215,808 (Number) (Numero)	U.S.A. (Country) (Paese)	5 July 2000 (Day/Month/Year Filed) (Giorno, Mese, Anno di Presentazione)	☑ Yes Si	☐ No No
(Number) (Numero)	(Country) (Paese)	(Day/Month/Year Filed) (Giorno, Mese, Anno di Presentazione)	☐ Yes Si	☐ No No
(Number) (Numero)	(Country) (Paese)	(Day/Month/Year Filed) (Giorno, Mese, Anno di Presentazione)	☐ Yes Si	☐ No No

Con il presente rivendico il beneficio previsto dal Titolo 35, Codice degli Stati Uniti, Comma 120, per qualsiasi domanda (o domande) de brevetto sotto indicata, ed entro i limiti nei quali il materiale indicato in ciascuna delle domande di brevetto non è stato rivelato nella precedente domanda di brevetto americana nel modo previsto dal primo paragrafo del titolo 35, Codice degli Stati Uniti, Comma 112, riconosco il mio dovere di rivelare il materiale d'informazione, cosi' come viene definito nel Titolo 37, Codice dei Regolamenti Federali, Comma 1,56(a), che possa essere venuto ad aggiungersi nel periodo intercorso tra la data di presentazione della domanda precedente e la data nazionale o internazionale PCT di presentazione di questa domanda:

I hereby claim the benefit under Title 35, United States Code, §120, of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a), which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (Numero di serie della Domanda di Brevetto)	(Filing Date) (Data di presentazione)	(Stato Giuridico) (Brevetto, In attesa di Brevetto, Abbandonato)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Numero di serie della Domanda di Brevetto)	(Filing Date) (Data di presentazione)	(Stato Giuridico) (Brevettato, In attesa di Brevetto, Abbandonato)	(Status) (patented, pending, abandoned)

Dichiaro inoltre con il presente che tutte le informazioni da me fornite sono in fede mia vere, e che tutte le affermazioni da me fatte sono in fede mia vere; dichiaro inoltre che quando ho fatto queste affermazioni ero al corrente del fatto che false dichiarazioni fatte intenzionalmente sono punibili con multa o incarcerazione, o ambedue, secondo quanto stabilito dalla sezione 1001 del Titolo 18 del Codice degli Stati Uniti, e che tali informazioni intenzionalmente false possono mettere a repentaglio la validità della domanda o brevetto rilasciata in base ad esse.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Italian Language Declaration

PROCURA: Io, sottoscritto inventore, nomino con la presente il seguente Procuratore (o Procuratori) o Agente (Agenti) che s'incarica di perseguire questa pratica e di portare a termine tutte le operazioni necessarie all'Ufficio Brevetti e all'Ufficio Marchi di Fabbrica pertinenti a questa pratica. (Elencare il Nome e il Numero di Matricola):

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (*list name and registration number*)

Richard W. Seed, Reg. No. 16,557
Robert J. Baynham, Reg. No. 22,846
George C. Rondeau, Jr., Reg. No. 28,893
David H. Deits, Reg. No. 28,066
William O. Ferron, Jr., Reg. No. 30,633
David J. Maki, Reg. No. 31,392
Richard G. Sharkey, Reg. No. 32,629
David V. Carlson, Reg. No. 31,153
Karl R. Hermanns, Reg. No. 33,507
David D. McMasters, Reg. No. 33,963
Michael J. Donohue, Reg. No. 35,859
Jane E.R. Potter, Reg. No. 33,332
Robert Iannucci, Reg. No. 33,514;
Lorraine Linford, Reg. No. 35,939
David W. Parker, Reg. No. 37,414
Ellen M. Bierman, Reg. No. 38,079
Ann T. Kadlecek, Reg. No. 39,244
E. Russell Tarleton, Reg. No. 31,800
Kevin S. Costanza, Reg. No. 37,801
Thomas E. Loop, Reg. No. 42,810
Stephen J. Rosenman, Reg.43,058
Brian L. Johnson, Reg. No. 40,033
Susan D. Betcher, Reg. No. 43,498
William T. Christiansen, Reg. No. 44,614
Gary M. Myles, Reg. No. 46,209
Eric J. Gash, Reg. No. 46,274

Lisa K. Jorgenson, Reg. No. 34,845
Robert D. McCutcheon, Reg. No. 38,717
Jeffrey D. Moy, Registration No. 39,307
Theodore E. Galanthay, Reg. No. 24,122

Recapito per la Corrispondenza:

Send Correspondence to:
Robert IANNUCCI
Seed Intellectual Property Law Group PLLC
701 Fifth Avenue, Suite 6300
Seattle, Washington 98104

Telefonare a: *(Nome e Numero)*

Direct Telephone Calls to: (*name and telephone number)*
Robert IANNUCCI
(206) 622-4900

Nome Completo dell'inventore primo e unico	Full name of sole or first inventor **Roberto PERITORE**
Firma dell'inventore Data	Inventor's signature Date 13 October 2000
Residenza	Residence TREZZANO SUL NAVIGLIO (MI) - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Via Donizzetti, 4 20090 TREZZANO SUL NAVIGLIO (MI) - Italy
Nome completo del secondo coinventore se applicabile	Full name of second joint inventor, if any **Alberto SALINA**
Firma del secondo inventore Data	Second Inventor's signature Date 13 October 2000
Residenza	Residence LIMBIATE (MI) - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Via Tarvisio, 32 20051 LIMBIATE (MI) - Italy

(Si prega di fornire stesse informazioni e firme di eventuali terzi e più coinventori.)

(Supply similar information and signature for third and subsequent joint inventors.)

Italian Language Declaration

Nome Completo del terzo coinventore se applicabile	Full name of third inventor **Andrea MERELLO**
Firma del terzo inventore Data	Third Inventor's signature Date Andrea Merello 13 October 2000
Residenza	Residence ARESE (MI) - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Via dei Platani, 23 20020 ARESE (MI) - Italy
Nome completo del quarto cointentore se applicabile	Full name of fourth joint inventor, if any **Lorenzo PAPILLO**
Firma del quarto inventore Data	Fourth Inventor's signature Date Lorenzo Papillo 13 October 2000
Residenza	Residence MILANO - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Via Cenisio, 87 20154 MILANO - Italy
Nome completo del _____ coinventore se applicabile	Full name of fifth joint inventor, if any **Francesco VAVALA**
Firma del _____ inventore Data	Fifth Inventor's signature Date Francesco Vavala 13 October 2000
Residenza	Residence ASSAGO (MI) - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Via Matteotti, 16B 20090 ASSAGO (MI) - Italy
Nome completo del _____ coinventore se applicabile	Full name of sixth joint inventor, if any **Gianluca VENTURA**
Firma del _____ inventore Data	Sixth Inventor's signature Date Gianluca Ventura 13 October 2000
Residenza	Residence CINISELLO BALSAMO (MI) - Italy
Cittadinanza	Citizenship Italian
Recapito o Casella Postale	Post Office Address Viale Sardegna, 9 20092 CINISELLO BALSAMO (MI) - Italy

(Si prega di fornire stesse informazioni e firme di eventuali terzi e più coinventori.)

(Supply similar information and signature for third and subsequent joint inventors.)